

POLYTHIOPHENES, BLOCK COPOLYMERS MADE THEREFROM,  
AND METHODS OF FORMING THE SAME

5

**ABSTRACT**

10 The present invention relates to polythiophenes, particularly regioregular head-  
to-tail poly(3-alkylthiophenes) (HT-PATs), block copolymers made therefrom, and their  
methods of formation. The present invention provides HT-PATs with well-defined,  
specific end-groups, functionalization of the defined HT-PATs, and incorporation of end  
group functionalized HT-PATs into block copolymers with structural polymers. The  
intrinsically conductive diblock and triblock copolymers, formed from the HT-PATs, have  
excellent conductivity and low polydispersities that are useful in a number of  
applications. The block copolymers of the present invention have been found to exhibit  
conductivities that range from a low of  $10^{-8}$  S/cm for certain applications to as high as  
several hundred S/cm or more.